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## What are Cancer Vaccines? [1]

This section has been reviewed and approved by the [Cancer.Net Editorial Board](#) [2], 09/2013

 *Listen to the [Cancer.Net Podcast: Understanding Cancer Vaccines](#) [3], adapted from this content.*

### Key Messages:

- Vaccines take advantage of the body's natural ability to recognize and kill harmful substances, such as bacteria and viruses, to help fight disease.
- Cancer prevention vaccines are given to healthy people to protect against cancer-causing viruses like the human papillomavirus (HPV) and hepatitis B virus (HBV).
- Cancer treatment vaccines are given to a person who has already developed cancer to boost the immune system's ability to identify and destroy cancer cells.
- A number of cancer treatment vaccines are currently being studied in clinical trials.

Vaccines (sometimes called vaccinations) are medicines that help the body fight disease. They help train the immune system to recognize and destroy harmful substances. There are two types of cancer vaccines: prevention vaccines and treatment vaccines.

### Cancer prevention vaccines

Cancer prevention vaccines are given to healthy people to prevent the development of specific cancers. They are similar to vaccines for diseases like the chicken pox or the flu in that they protect the body from viruses that can cause disease. Like traditional vaccines, cancer prevention vaccines must be given before a person is infected with a virus to provide protection.

There are three cancer prevention vaccines approved by the U.S. Food and Drug Administration (FDA):

- Gardasil is approved for the prevention of cervical, vaginal, and vulvar cancers in girls and women ages 9 to 26. It is also approved to prevent anal cancer in women and men, and genital warts in men and boys in the same age range. The vaccine prevents infection with the [human papillomavirus \(HPV\)](#) [4], which, if long-lasting, can cause these cancers (as well as other cancers the vaccine is not approved for, such as oral cancer).

- Cervarix, which also protects against HPV infection, is approved for the prevention of cervical cancer in girls and women ages 10 to 25.
- The hepatitis B vaccine prevents infection with the hepatitis B virus (HBV). Long-lasting infection with HBV can lead to liver cancer.

Talk with your doctor about whether you should be vaccinated against HPV and HBV.

## **Cancer treatment vaccines**

Cancer treatment vaccines are a type of immunotherapy [5] (also called biologic therapy), which are treatments designed to boost the body's natural defenses to fight a cancer. A treatment vaccine is given to a person who has already been diagnosed with cancer and may prevent the cancer from coming back, destroy any cancer cells remaining in the body after another type of treatment, or stop a tumor from growing or spreading.

### **How a cancer treatment vaccine works**

Cancer vaccines boost the immune system's natural ability to recognize and destroy things that are foreign and potentially harmful to the body. A strong, healthy immune system is able to identify antigens (substances on the surface of cells that are not normally part of the body) and attack them, typically eliminating them. The immune system is then left with a "memory" that helps it respond to those antigens in the future.

A cancer treatment vaccine takes advantage of the immune system's response to antigens. Often, cancer cells have specific molecules on their surface that are not present on healthy cells. When injected into a person, these specific molecules act as antigens, which stimulate the immune system to recognize and destroy cancer cells that have these molecules on their surface. Most cancer vaccines also contain adjuvants (substances that may help strengthen the immune response).

Most cancer treatment vaccines are still being researched and are only available through a clinical trial [6] (research study involving volunteers). However, in 2010, the FDA approved sipuleucel-T (Provenge) for men with metastatic prostate cancer [7] (cancer that has spread from the prostate to other parts of the body). Sipuleucel-T is a vaccine that is customized for each patient. First, white blood cells (cells that help the body fight infections and diseases) are removed from the patient's blood. They are then modified in a laboratory and infused back into the patient through a vein (similar to a blood transfusion) to teach the immune system to find and destroy prostate cancer cells.

### **Limitations of cancer treatment vaccines**

Developing successful cancer treatment vaccines is difficult. Some limitations of these vaccines are:

- Cancer cells suppress the immune system; this is how the cancer is able to grow and develop in the first place. Researchers are using adjuvants in vaccines to try to overcome this problem.
- Because cancer cells develop from a person's own healthy cells, they may not "look" harmful to the immune system. Therefore, instead of being identified as harmful to the body

and eliminated, the cancer cells are ignored.

- Larger or more advanced tumors are hard to eliminate using only a vaccine. This is one reason why cancer vaccines are usually given in addition to other treatments.
- The immune systems of people who are sick or older may not be able to produce a strong immune response following vaccination, limiting the vaccine's effectiveness. Also, some cancer treatments may damage a person's immune system, limiting its ability to respond to a vaccine.

Because of these reasons, some researchers think that a cancer treatment vaccine may be more effective for patients with smaller tumors or early-stage cancers.

## **Vaccines and clinical trials**

Clinical trials are important for learning more about cancer vaccines. Vaccines are being tested for several cancers [8], including:

- Bladder cancer
- Brain cancer
- Breast cancer
- Cervical cancer
- Colorectal cancer
- Kidney cancer
- Leukemia
- Lung cancer
- Melanoma
- Myeloma
- Pancreatic cancer
- Prostate cancer

Learn more about finding a clinical trial [9].

## **Questions to ask your doctor**

If you are interested in learning more about participating in a cancer treatment vaccine clinical trial, talk with your doctor. You may want to ask:

- Is there a vaccine being tested for my type and stage of cancer?
- Where is the clinical trial located?
- What is the vaccine and how does it work?
- How is this vaccine made?
- How and how often is the vaccine given?
- How long will I need the vaccine?
- What are the possible side effects?
- Is there another treatment option for this cancer?
- Is there anything else I need to know?

## **More Information**

Risk Factors and Prevention [10]

Treating Cancer [11]

## **Additional Resource**

National Cancer Institute: Cancer Vaccines [12]

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### **Links:**

[1] <http://www.cancer.net/navigating-cancer-care/how-cancer-treated/immunotherapy-and-vaccines/what-are-cancer-vaccines>

[2] <http://www.cancer.net/about-us>

[3] [http://www.cancer.net/sites/cancer.net/files/understanding\\_cancer\\_vaccines.mp3](http://www.cancer.net/sites/cancer.net/files/understanding_cancer_vaccines.mp3)

[4] <http://www.cancer.net/node/24561>

[5] <http://www.cancer.net/node/24726>

[6] <http://www.cancer.net/node/24876>

[7] <http://www.cancer.net/node/19569>

[8] <http://www.cancer.net/cancer-types>

[9] <http://www.cancer.net/node/24878>

[10] <http://www.cancer.net/node/24868>

[11] <http://www.cancer.net/node/25071>

[12] <http://www.cancer.gov/cancertopics/factsheet/Therapy/cancer-vaccines>